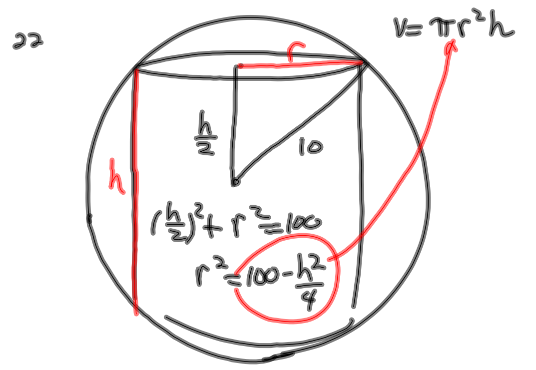

Oct 14-9:32 AM

4.4c Modeling and Optimization

Examples from Economics

Maximum Profit: If there is a maximum profit, it occurs when marginal revenue = marginal cost

Profit = Revenue - Cost

$$P=R-C$$

$$P'=R'-C'=0$$

$$R'=C'$$

Oct 25-8:00 AM

Suppose r(x) = 9x and c(x) = x^3 - 6x^2 + 15x, where x represents 1000's of units. Is there a production level that maximizes profit? If so, what is it?

x

$P=R-C$

$P'=R'-C'$

$$R'=C'$$

$$9=3x^2-12x+15$$

$$0=3x^2-12x+6$$

$$x=\sqrt{2}+2\approx 3.414$$

$$P'=9-(3x^2-12x+15)$$

$$P''=-6x+12\Big|_{x=3.414}<0$$

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average cost = c(x)/x

Minimum Average Cost: If there is a minimum average cost, it occurs when average cost = marginal cost.

$$A=\frac{c(x)}{x}$$

$$A'=\frac{x\cdot c'(x)-c(x)\cdot 1}{x^2}=0$$

$$xc'(x)-c(x)=0$$

$$\cancel{x}\cdot\boxed{c'(x)=\frac{c(x)}{x}}$$

Oct 25-8:06 AM

Suppose c(x) = x^3 - 6x^2 +15x, where x represents 1000's of units. Is there a production level that minimizes average cost? If so, what is it?

$A = \frac{c(x)}{x}$

$A = \frac{c(x)}{x} = c'(x)$

$\frac{x^3 - 6x^2 + 15x}{x} = 3x^2 - 12x + 15$

$A = x^2 - 6x + \cancel{15} = 3x^2 - 12x \cancel{+15}$

$0 = 2x^2 - 6x = 2x(x-3)$

$x = 3$

$A' = 2x - 6$

$A'' = 2 > 0$

Oct 25-8:08 AM

Oct 14-10:15 AM